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Patent claims

1. Method for control of the point in time of the measurement of the toner concentration in a developer mixture comprising toner and carrier,

- in which the developer mixture is mixed by a bucket roller (3) provided with buckets (8) and situated in a mixing device (7),
- in which a toner concentration sensor (10) for measurement of the toner concentration in the developer mixture is arranged adjacent to the bucket roller (3),
- in which magnet rails (9) are arranged on the buckets (8) of the bucket roller (3), and the respective magnet rail (9) is disconnected in each bucket except one in a region adjacent to the toner concentration sensor (10),
- in which the toner concentration sensor (10) emits a sensor signal (SS) that,
  - upon the passage of the bucket (8a) with the uninterrupted magnet rail (9), exhibits a first pulse-shaped spike (SP1) with larger amplitude caused by the magnet rail,
  - exhibits further pulse-shaped spikes (SP2, SP3) of smaller amplitude upon passage of the further buckets (8b, 8c)
  - exhibits a value indicating the toner concentration between the pulse-shaped spikes (SP),
- in which the point in time of the occurrence of the first pulse-shaped spike (SP1) is determined in the sensor signal (SS),
- in which the measurement of the toner concentration is implemented in a measurement window (MF) that lies after the occurrence of the first pulse-shaped spike (SP1) of the sensor signal (SS) in a region of the sensor signal (SS) that lies between the spikes (SP) caused by the buckets (8).

2. Method for control of the point in time of the measurement of the toner concentration in a developer mixture comprising toner and carrier,

- in which the developer mixture is mixed by a bucket roller (3) provided with buckets (8) and situated in a mixing device (7),
- in which a toner concentration sensor (10) that emits a signal (SS) indicating the toner concentration in the developer mixture is arranged adjacent to the bucket roller (3), which signal
  - exhibits pulse-shaped spikes (SP) upon passage of the buckets (8),
  - exhibits a value indicating the toner concentration between the pulse-shaped spikes,
- in which a magnet (11) is arranged on a shaft (13) of the bucket roller (3) and a Hall sensor (12) is arranged adjacent to the magnet (11) and to the bucket roller (3), which Hall sensor (12) emits a trigger signal when the magnet (11) passes by the Hall sensor (12),
- in which the measurement of the toner concentration is implemented controlled by the trigger signal in a measurement window (MF) that lies in a region of the sensor signal (SS) that lies between the spikes (SP) caused by the buckets (8).

3. Method according to claim 2,
in which a time interval (t(Excavator)) between occurrence of the trigger signal and occurrence of the next pulse-shaped spike (SP) in the sensor signal (SS) is determined once before the beginning of the measurement event, and the measurement occurs when the sum from this time interval (t(Excavator)) and a predetermined delay period (t(Delay)) has elapsed.

4. Method according to claim 3,

- in which magnet rails (9) are arranged on the buckets (8) of the bucket roller (3), and the respective magnet rail (9) is disconnected

in each bucket except one in a region adjacent to the toner concentration sensor (10),

- in which the toner concentration sensor (10) emits a sensor signal (SS) that, upon the passage of the bucket (8a) with the uninterrupted magnet rail (9), exhibits a first pulse-shaped spike (SP1) of larger amplitude that is used to determine the time interval (t(Excavator)) between occurrence of the trigger signal and occurrence of the first pulse-shaped spike (SP1).

5. Method according to any of the claims 1, 3 or 4, in which the temporal position of the pulse-shaped spike (SP) is indicated when the sensor signal (SS) has the largest rise.

6. Method according to claim 5, in which, to record the signal curve of the sensor signal (SS),

- successive individual measurements of the sensor signal (SS) are implemented at the same time interval,
- the difference of the successive measurement values (amplitude values) acquired via the individual measurements is generated,
- the highest determined difference value (DF) indicates the position of the pulse-shaped spike (SP).

7. Method according to claim 6, in which the temporal position of the pulse-shaped spikes is indicated when the curve generated from the difference values (DF) exceeds a predetermined threshold (SW1).

8. Method according to claim 1, 3 or 4, in which the temporal position of the pulse-shaped spikes (SP) is indicated when the pulse-shaped spikes (SP) of the sensor signal (SS) exceeds a predetermined threshold (SW2) or, respectively, reaches its highest value.

9. Method according to claim 5 or 8,
in which the temporal position of the pulse-shaped spikes (SP) is indicated when a combination rise/amplitude exceeds a threshold.

10. Method according to any of the preceding claims 1, 4 through 9,
in which, upon occurrence of the first pulse-shaped spike (SP1), the measurement window (MF) is placed after a time period (dependent on the rotation speed of the bucket roller (3)) calculated from the temporal position of the first pulse-shaped spike (SP1).

11. Method according to any of the claims 1, 4 through 9,
in which the measurement window (MF) is placed such that, after passage of the bucket (8a) with uninterrupted magnet rail (9), at least one further bucket passes by the toner concentration sensor (10).

12. Method according to claim 1, 3 through 11,
in which the measurement window (MF) is opened independent of the sensor signal curve for the case that no pulse-shaped spike (SP) has occurred in the sensor signal (SS) during a rotation of the bucket roller (3).

13. Method according to claim 12,
in which an error counter is incremented when no pulse-shaped spike (SP) is determined in the sensor signal (SS) during a revolution of the bucket roller (3); the error counter is decremented again when a pulse-shaped spike occurs again in the next revolution.

14. Method according to claim 13,
in which an error signal is emitted when the counter value of the error counter exceeds a predetermined counter value.

15. Method according to any of the preceding claims,
in which the mixing device is arranged in a developer station (2) for an electrophotographic printer or copier.

16. Arrangement for control of the point in time of the measurement of the toner concentration in a developer mixture comprising toner and carrier,
- in which a bucket roller (3) with whose buckets (8) the developer mixture is stirred is arranged in a mixing device (7) for the developer mixture,
- in which a toner concentration sensor (10) for measurement of the toner concentration in the developer mixture is arranged adjacent to the bucket roller (3),
- in which magnet rails (9) are arranged on the buckets (8) of the bucket roller (3), and the respective magnet rail (9) is disconnected in each bucket except one in a region adjacent to the toner concentration sensor (10),
- in which the toner concentration sensor (10) emits a sensor signal (SS) indicating the toner concentration, which sensor signal (SS) exhibits, upon the passage of the bucket (8a) with the uninterrupted magnet rail (9), a first pulse-shaped spike (SP1) determined according to the method according to claim 5 through 11 from which a measurement window (MF) can be derived in which the toner concentration is measured.

17. Arrangement for control of the point in time of the measurement of the toner concentration in a developer mixture comprising toner and carrier,
- in which a bucket roller (3) with whose buckets (8) the developer mixture is stirred is arranged in a mixing device (7) for the developer mixture,

- in which a toner concentration sensor (10)that emits a sensor signal (SS) dependent on the toner concentration is arranged adjacent to the bucket roller (3), which sensor signal (SS)
  - exhibits pulse-shaped spikes (SP) upon passage of the buckets (8),
  - exhibits a value indicating the toner concentration between the pulse-shaped spikes,
- in which a magnet (11) is arranged on a shaft (13) of the bucket roller (3) and a Hall sensor (12) is arranged adjacent to the magnet (11) and to the bucket roller (3), which Hall sensor (12) emits a trigger signal when the magnet (11) passes by the Hall sensor (12),
- in which the measurement of the toner concentration by the toner concentration sensor (10) occurs controlled by the trigger signal in a measurement window (MF) that lies in a region of the sensor signal (SS) that lies between the spikes (SP) caused by the buckets (8).

18. Arrangement according to claim 17,

- in which magnet rails (9) are arranged on the buckets (8) of the bucket roller (3), and the respective magnet rail (9) is disconnected in each bucket except one in a region adjacent to the toner concentration sensor (10),
- in which the toner concentration sensor (10) emits a sensor signal (SS) that, upon the passage of the bucket (8a) with the uninterrupted magnet rail, exhibits a first pulse-shaped spike (SP),
- in which the first pulse-shaped spike (SP1) is determined and the measurement window (MF) is established dependent on the time interval t(Excavator) between trigger signal and occurrence of the first pulse-shaped spike (SP1) of the sensor signal (SS), delayed by a delay period (t(delay)).

19. Arrangement according to claim 18,

in which the magnet (11) and the Hall sensor (12) are arranged outside of the mixing region of the mixing device.

20. Printer or copier comprising an arrangement according to any of the claims 16 through 19.